Smart City Practices
The Case of Songdo and the India Smart Cities Mission

László Gere[6]

Abstract

Technological innovations are key drivers of the 21st century; the 4th industrial revolution is fundamentally changing our way of life in the very near future. The concept of 'smart city' is something that cannot be avoided either – urban planners and urban management professionals have to deal with it. In my argument it is a prerequisite in the future of urban planning. Therefore, the most important question in this respect is how we can manage this issue (i.e. the introduction of smart solutions in urban spaces and services) consciously, in close co-operation with other actors. The first part of the article shows the challenges raising through the application of smart city solutions: the exact definition of the concept, the sectoral distinctions in its understanding, the different planning approaches of smart cities, and the socio–economic tensions emerged by smart city developments. The second part of the article shows with examples how the smart city concept works in practice, through the case of the South Korean town, Songdo, and the Smart City Programme of India.

Keywords: urban development, urban planning, smart cities, India, South Korea

6 Institute of Geography and Earth Sciences, Doctoral School of Earth Sciences, University of Pécs; Pallas Athene Innovation and Geopolitical Foundation, Hungary; gere.laszlo@paigeobudapest.hu

I. Introduction

Urban development issues have become more and more important globally in recent decades, mainly because of the ever-increasing economic, social, political and geopolitical role of cities. Info-communication technology (ICT) solutions are also playing a more and more extensive role in the operation and management of cities; therefore, the urban management and ICT solutions are increasingly interwoven and interconnected. This process is driven basically by three key factors:

1. the demographic shift;
2. the spread of mobile devices; and
3. the so-called Internet of Things.

These three factors lead to the appearance of the smart city concept in urban planning, which differs from any other urban development concepts in many ways. The so-called smart solutions offer more effective tools for certain problems, but they also pose further serious challenges to be solved. The smart city developments become more and more complex issues with the involvement of different kinds of actors and in cities with very different needs and opportunities; therefore, to deal with this issue from the urban planner's point of view seems to be of great importance.

Although the concept of smart cities is quite a new one, there are examples of projects that have already been carried out or at least are in progress. As case studies, the article deals with two Asian projects, the *Songdo Smart City* project from South Korea and the India *Smart Cities Mission*.

II. Three Sides of the Recent Urban Change

The rise of new technologies and digital solutions is apparent in every areas of our lives, and cities are no exceptions in this regard. As more and more people live in urban areas, the pressure is also growing on the city management side to provide general services at high standards, and technology seems to be the most effective way to achieve that. This issue is the most evident in the developing countries, where the urbanization level is projected to be the highest in the coming decades. One side of this recent urban change is demographic, and two sides are technological as it was introduced earlier.

II.1. Demographic trends

Throughout history we have mostly lived in rural areas. The turning point in urbanisation was between 2007–2008; since then more people have been living in urban areas than in rural areas (UN 2015). Some experts, while searching for the answer why the application of smart city solutions started to boom this time, and why this area became so important this time, found this shift, from mostly rural to mostly urban population, as the first key factor (Townsend, A. M. 2013).

In 1900 (way after the first urbanisation period, the first industrial revolution), still only around 13 percent of the global population resided in urban areas; in 1950, the share of rural and urban population was ⅔ to ⅓. In the following decades, rapid urbanization has started, and

according to the latest projections, by 2050 the share of hundred years ago will have just turned, 68 percent of the population will reside in urban areas and only 32 percent will live in rural areas (UN 2018). All these changes, together with another forecast that by 2050 the number of global population will reach almost 10 billion (UN 2017), mean that more than 6.5 billion urban residents can be counted instead of the almost four billion today. Today the share of urban population is the lowest in the developing countries – in Africa (43 percent) and Asia (50 percent) –, and it is projected that these areas will witness the greatest urbanization in the future (UN 2018). Concerning the sheer numbers, significant urban population resides in these areas already, for instance, only in China, around 1 billion urban inhabitants are projected by 2030 (Woetzel, J. et al. 2009). Nowadays, only in the developing world, more than a million people are born or move into cities every week (PADCO 2006 p. 1.).

In the countries of the developed world, no further significant urbanization is probable; nevertheless, the economic, cultural and political weight of the cities is still expected to grow in these countries.

II.2. Technological trends

In the 21st century, we are facing significant technological changes which have already begun shaping our everyday lives, our behaviours and habits. It is most often referred to as the *fourth industrial revolution*, which (similarly to the previous ones) will fundamentally transform our lifestyles, our ways of working and our social relationships as well. According to an expert of this topic, Klaus Schwab, the scale, extent and complexity of this transformation will surpass any of the previous industrial revolutions (Schwab, K. 2016). Schwab, in his economy-centred writing, also describes the impacts of the previous industrial revolutions on production: the first industrial revolution used steam power to mechanize production, the second created mass production through electric power, and the third used electronics and information technology to automate production. Now, the fourth industrial revolution, as a continuation of the third one, through *digital revolution*, will implement the fusion of different technologies, blurring the lines between the physical, digital and biological areas (Schwab, K. 2016 p. 2.).

Technological innovations are increasingly channelling into the everyday life of the cities, and this process reached a turning point in 2008 according to Townsend, who says that this date designates a threshold for the whole global civilization because of three factors: the first one, the demographic shift was already mentioned (Townsend, A. M. 2013). The second is that in 2008, for the first time, the number of wireless internet users exceeded those who connected through cable (or to put it in another way, today more people connect to the internet through mobile devices than traditional desktop computers). The third one is that in 2008 the number of internet-connected devices exceeded the number of 'connected' people (and the further growth is exponential); in other words, from this date can we speak about the age of the internet of things (IoT) (Evans, D. 2011).

Eventually, these demographic and technological shifts have led to the concept of *smart cities*. This term has no exact meaning; therefore, in the following the article attempts to find a definition for it, and then it introduces some key challenges related to the application of smart solutions.

III. What is a Smart City?

III.1. Different terms for the same concept?

The emergence of the smart city concept is definitely related to the spread of digital technology, the internet and the mobile electronic devices. In this sense, it has antecedents, or more or less similarly used terms. These include, inter alia, *digital city* or *intelligent city*, coined in the 1990s and used widespread for a long time, as well as many 'co-concepts' such as *information city*, *innovative city*, *virtual city*, *liveable city*, *eco-city*, *green city* and *sustainable city* (Eremia, M. et al. 2017). Mostly, these labels are given to certain cities only to enhance their attractiveness, as well as to make them somehow unique, to help them stand out from other cities; therefore, complex and hardly understandable terms emerge as well (*smart eco-city*, *smart sustainable city*), or even strange labels like 'wise city' or 'brilliant city' (Lux Research 2015, cited by Z. Karvalics, L. 2016).

Although the term *smart city* started to be used in literature on urban development just around a decade ago, the expression had been coined somewhat earlier – first, not specifically related to cities, but more comprehensively as 'smart

growth'. Harrison and Donnelly originates the spread of the term from the late 1990s, specifically in relation with a study on *smart growth* (Harrison, C. – Donnelly, I. A. 2011). From the middle of the 2000s many tech-companies (Siemens in 2004, Cisco in 2005, IBM in 2009 etc.) applied the label as a common reference for complex IT systems in urban infrastructure and the operation of public services (Harrison, C. – Donnelly, I. A. 2011 p. 2.). At that time did the tech-companies begin to create their first dedicated divisions to urban development issues (e.g. IBM Smarter Cities[7], Siemens Smart City[8], Microsoft CityNext[9]).

III.2. The definition of smart city

On definition issues, almost every author of this topic points out right at the beginning of their papers that there is no unified or standardized smart city definition that would be accepted or applied by everyone (Chourabi, H. et al. 2012; Cavada, M. et al. 2014; Albino, V. et al. 2015; Calzada, I. 2016; Z. Karvalics L. 2016). There are various reasons behind that, but the two most important ones are: first, we are talking about the combination of different tools and systems; therefore, smart city is more like a *label*, a fuzzy concept that only helps us to avoid having to use complicated circumscriptions (Albino, V. et al. 2015 p. 4.). Second, a wide range of professionals with entirely different approaches are using this term; therefore, every area of expertise highlights their understanding when they conceptualize smart city solutions.

Of the almost infinite number of definitions, this article has chosen one that meets the following criteria: it is comprehensive, objective (which means that it is not a definition of any specific area of expertise, institution or corporation) and well-known in the Hungarian literature – the author of this paper certainly did not want to create another new definition. The standardization of the concept and the establishment of a general indicator system has already started to measure and assess the effectiveness of the smart city instruments by the International Standardization Organization (ISO 2017), along with the British Standards Institution, and the article found the latter (BSI 2014 p. 12.) the

7 https://www.ibm.com/smarterplanet/us/en/smarter_cities/overview/ – 2018. 09. 14.

8 http://w3.siemens.com/topics/global/en/sustainable-cities/Documents/smart-cities-en/index.html#/en/home – 2018. 09. 14.

9 https://enterprise.microsoft.com/en-us/industries/citynext/ – 2018. 09. 14.

fittest to clarify the subject of this writing. According to this definition, smart city means the 'effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens' (Lechner Knowledge Centre 2015)[10].

III.3. Key challenges related to smart cities

There is an extensive literature on the different subjects and scientific discourses related to smart city topics from the possible planning methods and approaches to its socio–economic impacts, application issues and the practical challenges as well. However, due to the lack of data, the opportunities to empirically support the statements on the long-term impacts of smart cities are rather limited. This topic has not attracted much research yet (which is quite explicable, regarding the fact that it is a relatively new phenomenon). The literature deals with the key performance indicators (KPI) of smart cities, as a method for making the results measurable (CityKEYS 2016) or with the adaptation and scaling up smart city projects (Winden van, W. 2016), but there is still no harmonized methodology to evaluate and assess the impacts. The aim of this article is rather to raise awareness on the key questions regarding this issue.

One of the UN's publications on smart city infrastructure collected five key challenges related to the implementation of smart city infrastructure concepts. The report highlights that

1. smart city developments have to be adapted to the local contexts (need to be *localised*);
2. on many levels of the developments and application of smart city solutions, there is a need for proper human resources, cities and policy makers should manage skills gaps;
3. new kinds of financial models have to be developed;
4. cities have to find the right balance between top-down and bottom-up approaches; and
5. smart cities have to be inclusive, taking into account all groups of citizens (UNCTAD 2016 pp. 8–14.).

Other authors and experts are concerned about the focus of smart city developments: since it is a huge market opportunity for technology companies (that could

10 The Hungarian translation of this definition is also taken by Lechner Knowledge Centre.

take $400 billion to $1.5 trillion between 2015–2020, according to the estimations) (Deloitte 2014), residential, or communal interests could be subordinated to corporate interests due to their business-driven approach (Hollands, R. G. 2015; Z. Karvalics L. 2017. p. 17.). There is also a possibility that the smart city concept only strengthens the already existing corporate-oriented approach of cities, just as the high-tech rebirth of the so-called *entrepreneurial city* (Hall, T. – Hubbard, P. 1996). Although corporate visions imply that everyone will automatically benefit from the urban use of ICT-tools, wealth and well-being will equally be distributed among all, which would mean some kind of technological utopia impossible to realize; furthermore, it covers many socio–economic challenges that could be managed only through people-centred and resident-focused initiatives. Urban development experts agree that the smart city cannot be left to the market, cities themselves have to shape the market (Robinson, R. 2015). The corporate-driven approach has other unfavourable consequences on the urban planning process, for instance *centralization–orientation* (over-planning and over-regulation of developments; preference of top-down approach, because of efficiency aspects), *metropolis-centeredness* (companies will be the most active in big cities because of the economies of scale), *universalism* (companies tend to develop universal solutions that can be spread in as many cities as possible, maximizing their profit) (Z. Karvalics L. 2017), or it can *erode citizen activity*, because by offering automated solutions to the problems, self-activity and self-organization decreases, the spread of community-driven solutions becomes less active (Robinson, R. 2015, cited by Z. Karvalics L. 2017).

Not surprisingly, among urban planners, *technology-driven developments* are claimed to be the lowest level of smart city development approaches, that most of the times lose sight of the most important dynamics between the city and its inhabitants (Townsend, A. M. 2013). The second level is the *technology enabled, city-led developments*, where the city takes the lead in developing its own future, and it decides what role the smart technologies and innovations should play in the operation of the city; and the highest level is the *citizen co-creation*, where citizens can contribute to the developments through their ideas or can be involved as investors, either way actively participating in the development activities (Cohen, B.

2015). The human factor, the social capital, the local know-how and the importance of lifelong learning are highlighted as key components of successful smart city developments also in other sources throughout the literature (UNCTAD 2016).

To understand the challenges emerging from smart city planning, the following sections of the article introduce two Asian cases, and briefly evaluate their approaches based on the above-discussed aspects.

IV. The Case of Songdo and Its Critique

IV.1. The development of a new city

Songdo IBD (International Business District) is located in South Korea, on the coast of the Yellow Sea. Currently, its population is around 110 thousand[11]. It does not meet its planned population (250 thousand), since investments are not finished yet (the development started in 2002, its completion date keeps pushing forward from 2015 to 2022 at the moment) (White, C. 2018). The district of an area of 6 km^2 is about a 15-minute drive from Incheon International Airport, from where ⅓ of the world's population is accessible within a 3.5-hour flight. In Songdo, a town built from scratch, an environmentally-friendly settlement was created by applying advanced technology infrastructure, which is able to adequately address today's global environmental challenges.

In addition to environmental sustainability, however, urban planners also paid attention to the economic one, and, due to its geographical position and the services provided by advanced technologies, Songdo aimed to be the economic hub of East Asia. Regional markets, including China, Japan or Russia are easily accessible from here (Songdo IBD 2018).

Songdo was built as part of the former South Korean President, Lee Myung-bak's (2008–2013) effort to promote low CO_2 emission and environmentally sustainable urban growth as basic principles in the development of South Korea (Lobo, R. 2013). The investment of almost $40 billion has been implemented in a PPP construction in cooperation with IT-companies and the local authority to create an environmentally sustainable town, a vivid international economic hub.

11 Christine Lee's (Gale International) answer to our e-mail request. According to the investor's homepage, the population of the new district is around 36 thousand people. – http://songdoibd.com/about/#growth – 2018. 09. 14.

Master planning a town has given developers an enormous opportunity, since it is easier to plan and implement a new settlement than transforming an existing one. Learning from architectural mistakes in the past, there was the opportunity in the planning phase to construct an energy-efficient, environmentally sustainable town, applying cutting-edge technologies as well as relying on architectural solutions. Songdo's main aim was to bring together green space, accessibility and advanced technology to create an improved way of life.

IV.2. Main characteristics of Songdo

40 percent of Songdo's area is dedicated to green space. In the heart of the town lies the Central Park, covering 10 percent of the settlement's area, inspired by and named after Manhattan's Central Park. In addition, several smaller parks, public spaces and lots of trees make Songdo greener (Garfield, L. 2018).

Songdo is a *walkable city*. As a result of conscious design, every urban function is within walking distance from the heart of the town, Central Park. Schools, offices and shops are within a 15-minute walk from here, because according to surveys, if people need to walk more than 10–15 minutes they will tend to get in their car. This contributes to the significant reduction of the town's carbon footprint. There is a 25-km network of bicycle lanes, which is a safe way to get from one place to another, and for larger distances, public transport can be used: an underground express train links the district with Seoul, cutting travel time to the South Korean capital down to less than 30 minutes.

In addition to the architectural solutions, another important element of creating an environmentally sustainable town is applying cutting-edge technological solutions, which are supposed to make Songdo a smart city. Advanced ICT-technologies are applied to operate its infrastructure, to improve the town's quality of life and to provide efficient services. All buildings are connected through an information system: everything, from fire alarm systems to heating and the security system are interconnected. Consequently, its operation is much more cost-effective, and residents can adjust their homes' temperature, lights, etc. – even remotely (Cisco 2011).

Songdo is taking energy efficiency even further. Homes and various institutions are connected

by a telecommunications system – provided by Cisco –, making people available through video installed in TV screens. This further reduces the town's carbon footprint by curbing people's need to travel. These innovations are helping reduce energy consumption in each building by 30 percent, and the whole town produces ⅓ fewer greenhouse gases as compared to another town of the same size (Garfield, L. 2018).

In Songdo, there are no garbage trucks in the streets, since all apartment buildings, offices and street-corner trash cans are connected by an underground system of pipes, where trash is automatically sorted and recycled, buried, or burned for fuel. The operation of the waste management system currently requires just seven employees for the entire district (Arbes, R. – Bethea, C.).

Sensors and microchips collect data for almost all areas of the operations of the town; these are processed by a central system, aiming to make Songdo's operation even more efficient. Street lights, for example, adjust to the number of pedestrians – saving a considerable amount of energy (Rijmenam van, M. 2013). Traffic lights work in line with real-time needs. Cars are equipped with RFID (Radio Frequency IDentification) tags to send geo-location data to the central monitoring unit identifying black spots or congestions, and then to divert traffic with the help of traffic lights (Wang, B. 2015).

There are several other town operation solutions making this urban environment more sustainable. Solar and wind energy is used to manage the energy demands of the town; rainwater is trapped and used to water parks, wash streets and flush toilets.

To conclude, Songdo aspires to be a model for future cities in which, by the deployment of state-of-the-art technologies, an eco-sustainable urban environment is working, addressing global environmental challenges.

IV.3. The critique of Songdo

When examining the case of Songdo, it is important to note that the town was not born as a result of organic, bottom-up development, but it was artificially created top-down by business enterprises. Consequently, its society does not reflect a 'natural status', since 'its residents went through a selection process, the fundamental preferences of which focus on knowledge serving the city' (Jinil, Y. 2014). It means that such residents have been moving to Songdo who fulfil

the functions required to operate the town – developers, researchers, students, businessmen –, and can afford the real estate prices that are higher than those in the capital. Therefore, the population of Songdo, regarding qualifications, income and conditions of living, can be regarded homogeneous, that is, no considerable social inequality can be detected locally.

At national level, however, we can establish that 'this type of selection generates significant social exclusion. Citizens with lower level of education and of a lower social status are excluded from the welfare services of the city and the benefits of a ubiquitous information technology' (Jinil, Y. 2014). That is, the technological achievements in Songdo are available to those who have enough money and adequate qualifications to live here. This brings them further advantages, increasing social inequalities within society.

The gap is widened between the residents of Songdo and others living in other Korean settlements by several factors: the town was built with significant state subsidy, (also) financed from the payments of citizens living outside Songdo, while its benefits are enjoyed only by a thoroughly selected stratum of society. On the other hand, real estate prices in Songdo prevent a wider circle of the Korean society from taking advantage of the developed infrastructure and the technological solutions, that is, they suffer a competitive disadvantage as compared with the residents of Songdo.

From the town's viewpoint, however, it is not necessarily viewed as a failure, because it is not Songdo's aim to reduce social inequalities. It declared its aspiration to become the hub of international companies with its 'unmatched quality of life' provided by its infrastructure and services. 'The concept of the first wave of smart cities – including Songdo – does not converge towards social justice but pursues the wellbeing of selected residents', while keeping environmental aspects in view (Jinil, Y. 2014 p. 38.). Master-planned smart cities, such as Songdo in South Korea, are able to satisfy two of the three dimensions of settlements (economy, natural and built environment, society) to a high standard, but offer no solutions to social issues.

V. The India Smart Cities Mission and Its Critique

Currently, the share of urban population in India (according to the most reliable census data from

2011) is still relatively low, only 31 percent, although it is estimated to reach 40 percent by 2030 (Ministry of Urban Development 2015). To prepare for the further increase in urban population, as well as to give an adequate answer for the most challenging issues, to fix the infrastructural and public service deficiencies and to improve the environment, the Government of India announced a national level *Smart Cities Mission* in 2014.

V.1. National urban development programme

After its election in May 2014, the governing party (BJP – Bharatiya Janata Party) announced the 100 Smart Cities Programme, focusing more than ever on urbanisation (recognized as one of the most important factors of economic development). Its core concept was the building of cutting-edge infrastructure and the implementation of technology-driven governance through investment promotion initiatives. The programme has three pillars: competitiveness, quality of life and the sustainability of smart cities (Roy, S. 2016).

The Smart Cities Mission is strongly related to Narendra Modi's (Prime Minister of India) ambitious vision on 'Digital India'. As Modi said in one of his speeches: 'Cities in the past were built on riverbanks, they are now built along highways. But in the future, they will be built based on availability of optic fibre networks and next-generation infrastructure.' (Lakshmi, R. 2015) According to the large-scale urbanisation plan, in 4 rounds, 100 chosen cities (with nearly 100 million inhabitants impacted) will be rehabilitated as well as renewed by smart city tools with a $15 billion budget in total (Smartnet, n.d.).

Cities can apply in the framework of a 'smart city challenge', the funds will be allocated to the 100 winner cities between 2017 to 2022 and the project outcomes are expected after 2022 (originally the project duration was five years, from 2015–2016 to 2019–2020 as per the mission statement and guidelines) (Jadhav, R. 2018).

The targeted cities are not the biggest ones (just some of them), but the so-called *satellite towns* around big cities. The purpose of these settlements is to ease the pressure on big cities, and that is also the reason why the government would like to support them. Big cities could not keep pace with the huge population income (mostly residing in large slums); therefore, the mission is focusing more on

middle-sized cities and towns. The Smart Cities Mission is supposed to be just the first step, if the programme succeeds, it would 'set examples that can be replicated both within and outside the Smart City, catalysing the creation of similar Smart Cities in various regions and parts of the country' (Smartnet, n.d.).

V.2. Is smart city the solution to everything?

The governmental efforts are clear and fully legit, concerning the above-mentioned processes: India struggles to develop its economy at the required rate, in which cities (as economic centres) play the key role. Since the two most important challenges are the lack of proper infrastructure and the limited availability of public funds, it seems evident to improve these areas. In urban development it is also obvious to follow the latest trends and build smart cities nationwide; on the one hand, these will be equipped with high-tech infrastructure, on the other hand, the developments will attract private sources, and that way boost economy. However, this overarching development vision ignores local characteristics; moreover, the cultural, historical and social embeddedness of the developments degrades as secondary issue. Consequently, the results will not meet the expectations: the social convergence and the strengthening of the middle class. On the contrary, further polarisation of the society can be expected.

It is a general concern about large-scale smart city developments that because business interests are different from national interests, local characteristics will be ignored. The corporate smart city-narrative itself limits residential involvement and democratic decision-making. The values of the urban inhabitants are covered by the profit-oriented global IT-software- or property investor companies' interests, strengthened by the trend that cities practically 'sell' themselves through the 'open for businesses' slogan, and will be less able to stress their own interests (Hollands, R. G. 2015). Some experts call the privatisation of urban space a 'new urban colonialism' (Datta, A. 2015), and to a certain extent, that is what happens through the India Smart Cities Mission.

One of the most frequent critiques is that the Smart Cities Mission does not address the most challenging issues of the Indian cities. Their most pressing challenge is not that they have inadequate general services, but they have no general services at all. 94 percent of Indian cities have no access to

even a partial sewerage network, only 21 percent of wastewater is treated, 50 percent of solid waste is collected, and 24 percent of the urban population lives in slums. The Smart Cities Mission seems to implement world-class urban developments without addressing these issues (Roy, S. 2016).

Besides the share of slum-dweller population, the Smart Cities Mission also ignores the fact that a significant share of the Indian population (70 percent, according to some estimations) works in the informal sector. The Indian society is already considerably unequal, and some social scientists warn that smart cities could enhance social polarization. Segregation and the building of 'gated' cities is a real threat, because only the upper class can afford to live in these newly-built smart neighbourhoods, everyone else is excluded. It is resulted from the top-down development approach, regardless of the locals and their actual needs (Assink, S. 2015). Smart cities could further consolidate the divergence between the rich and the poor, resulting in a dual social structure (Kozak, I. 2015).

Analysing the political–cultural dimension of smart city developments, a study concluded that the keys for successful developments include the exact understanding of the smart city concept itself and its relevance in Indian context, as well as a different political–governmental environment in India, considering culture-specific characteristics (Das, D. K. 2017). Other experts also stress that greenfield developments and one-size-fits-all solutions ignore the physical, cultural, historical and political contexts of the cities; therefore, they are doomed to failure (Roy, S. 2016).

VI. Conclusion

Digital technology and innovations in info-communication have fundamentally changed the way of life, our perceptions on different things and processes, even our needs and demands. These changes have serious impacts on urban development as well, and although we cannot fully evaluate them at the moment, urban planners should be prepared for future and be aware of the possible opportunities and threats.

Even urban experts tend to think about smart city solutions as an 'optimal' or 'better' way a city could work. Beyond doubt, smart city tools have (or at least *could have*) several positive outcomes on every part of a city's life from mobility to jobs, from energy use to housing. At the same time, what seems to be perfect

in theory is not that in practice. This article has intentionally focused on unsolved questions, concerns and uncertainties about smart cities, illustrated by two controversial examples from East and South Asia. However, the author's aim through this introduction was not to diminish the significance of smart cities or technological innovations in cities, but to contribute to a more conscious planning approach in this field.

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